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1995 Striped Bass Fisheries Monitoring Report

Massachusetts

Prepared for the ASMFC Striped Bass
Technical Committee - April 1996

Prepared by
Paul J. Diodati

*Massachusetts Division of Marine Fisheries
92 Fort Avenue
Salem, Massachusetts
(508) 745-3107*

Introduction

This report characterizes the commercial and recreational striped bass fisheries that Massachusetts conducted during 1995. Monitoring programs, which are considered to be essential elements of the long-term management approach described in Section 5 of the Atlantic States Marine Fisheries Commission's (ASMFC) Fisheries Management Report No. 24 (Amendment #5 to the Interstate Fishery Management Plan for Atlantic Striped Bass), collected the information. Several data sources were used to estimate harvest, total catch (which include fish caught but released alive), and catch composition (size, sex, and age). These included, Massachusetts Division of Marine Fisheries (DMF) and National Marine Fisheries Service (NMFS) based programs (Diodati, 1990).

Harvest and Losses

Commercial Fishery

Season: July 1 - September 9 (The fishery operated under an open (21d) - close (7d) sequence until the quota was reached)

Harvest Quota: 750,000 pounds (The harvest allowed by Amendment #5 was 999,000 pounds but Massachusetts regulatory action reduced that amount)

Allowable Gear Type: Hook and line

Minimum Size: 34 inches total length

Licensing and Reporting: To purchase striped bass directly from fishers, we required that fish dealers obtain special authorization from the DMF besides standard seafood dealer permits. Dealer reporting requirements included weekly telephone reports of all striped bass purchases; DMF supplied a toll-free number and an interactive telecommunication system for this purpose. Following the close of the season, we also required that dealers provide a written transcript consisting of purchase dates, number of fish, pounds of fish, and names and permit numbers of fishers from whom they purchased.

Fishers had to have a commercial fishing permit and a special striped bass fishing permit to sell their catch. They also had to file catch reports at the end of the season, which included the name of the dealer(s) that they sold to and extensive information describing their catch composition and catch rates. In addition, many fishers voluntarily provided daily fishing logs. The dealer telephone survey was used to gauge the distance to the harvest cap, while the dealer written transactions provided the final estimate of the harvest. Information from voluntary logs was used to characterize effort in the fishery.

Methods: Size distribution of the harvest was estimated from 562 striped bass sampled by the DMF at dealerships throughout the state. I conducted a functional geometric regression of weight on length on 5,804 fish sampled from the 1982-1995 commercial harvest to derive the following weight-length relationship:

$$W = .0002567L^{3.097} \quad (1)$$

where W equals weight in pounds and L equals total length in inches. Expression (1) was used to estimate any missing length or weight values.

Catch reports collected from 76% of licensed commercial fishers were used to characterize the disposition of the catch (the proportion kept or released), the catch weight and size composition by category. Pounds and numbers reported for each category were expanded by 9% and 8%, respectively to compensate for under-reporting by fishers vs. dealers.

Harvest Levels and Catch Composition

Dealer transcripts showed 782,000 pounds (41,200 fish) were harvested during 1995. The quota has been reached over a shorter period each year since 1990. The shorter season lengths are a combined result of annual increases in effort (hours fished per

day) and increases in striped bass biomass and abundance (Box 1).

Size composition by category of disposition is presented in Tables 1 (numbers) and 2 (pounds). The commercial catch of 188,600 striped bass (2,732,400 pounds) was dominated by the released sub-legal category (RELSUB), 70% by number and 59% by weight. The CONSUM category represents what commercially licensed anglers harvested for personal use and is counted as a recreational loss later in this report. Some commercial license holders, as in past years, reported releasing legal-size fish during the commercial season (15% by number - RELLEG). About 28% of total catch was greater than 34 inches.

Box 1. Attributes of the Massachusetts Striped Bass Commercial Fishery: 1990-1995.

SEASON	SEASON LENGTH (D)	HARVEST (LBs/NOs) 000s	DEALER PERMITS	FISHING PERMITS	HOURS FISHED	h/d	NOs/d
1990	93	160.6/6.3	95	1,498	87,000	0.94	0.07
1991	59	234.8/10.4	92	1,739	82,900	1.41	0.13
1992	39	239.2/11.3	135	1,861	70,000	1.79	0.16
1993	35	262.6/13.0	152	2,056	55,100	1.57	0.24
1994	24	199.6/10.4	150	2,367	43,200	1.80	0.24
1995	57	782.0/41.2	161	3,353	149,700	2.63	0.27

Age and Sex Composition

A sub-sample of 524 striped bass sampled from the 1995 commercial harvest was used to estimate age and sex. Age was determined from scales and sex was determined by visual inspection of gonadal tissue (Sykes Method). Age ranged from 6 to 16 years, and 94% were females (Box 2). Approximately 90% of the sub-sample consisted of individuals from 1984-1988 year classes (ages 8-11).

Box 2. Age, Sex and Size Composition of Striped Bass Sampled From the Massachusetts 1995 Commercial Harvest.

YEAR CLASS	NO.	%	MEAN LENGTH	MEAN WEIGHT
1989	2	0.4	35	14
1988	22	4.2	35	15
1987	109	20.8	35	16
1986	177	33.8	36	17
1985	131	25.0	38	20
1984	55	10.5	39	22
1983	21	4.0	40	22
1982	5	1.0	43	32
1981	1	0.2	44	36
1979	1	0.2	50	44

Estimation of Effort

Total hours fished from standard catch reports and average hours per trip from voluntary logs were used to estimate effort. To compensate for non-reporting, effort data was expanded by 24% (the outstanding proportion of catch reports). Effort during the 57d season (between Jul 1-Sep 9) amounted to 149,675 h fished and trips averaged 5.3 h. These figures imply 28,455 trips were conducted.

Characterization of Other Losses

Release mortality was estimated by using a hook-release mortality rate of 8% (Diodati 1990) applied against the RELSUB and RELLEG catch in Tables 1 and 2. Total losses due to release mortality were 11,295 fish weighing approximately 144,565 pounds.

Recreational Fishery

Season: None

Daily bag Limit: One fish per person

Allowable Gear Type: Hook and line

Minimum Size: 34 inches total length

Licensing and Reporting Requirements: None

Harvest levels

Harvest and total catch estimates were provided by the NMFS MRFSS (Salz 1996). Massachusetts paid for 4,000 additional intercept interviews which began during wave 3. A similar "add-on" has been conducted since 1988, however prior to 1995, it began in wave 2. Reference should be made to Osborn and Salz (1994) for a description of the new trip estimation procedure and its affect on catch.

The same sources of information described in previous sections were used to estimate the length distribution of the CONSUM and RELLEG categories, except that RELLEG data collected during the commercial season was excluded. Size distribution of the sub-legal catch came from information provided by a volunteer salt water angler survey. This is a DMF recreational log-book program that was newly implemented in 1995. All weights were estimated by using expression (1).

The preliminary estimate of total catch (including fish released) is 3,350,700 striped bass ($pse=6.6$) weighing 18,678,900 pounds (Tables 4 and 5). Total catch increased substantially from 1994 levels (1,956,000 fish), but landed harvest between years remained somewhat consistent. The number of legal size fish caught and released during 1995 was 16%; this fraction has ranged (between 15-25%) since 1990.

Estimation of Effort

Information from commercial catch reports, excluding that collected during the commercial season, and information from volunteer recreational logs was used to estimate effort. The logs suggest that 2,280,121 h were spent fishing for striped bass. Average hours per trip was 4.6. These figures imply about 750,000 trips.

Characterization of Losses

The same methods and rates previously described (under **Characterization of Losses** in the commercial fishery section) were used to estimate recreational losses. Release mortality of sub-legals was 220,200 fish (440,500 pounds) and release mortality of legal size stripers was 42,000 fish (914,600 pounds). Given that a new source of information (volunteer recreational logs) has been used to derive size composition, comparisons with past years may not be valid.

Bycatch in Other Fisheries

During 1994, DMF sea-sampling efforts identified striped bass as bycatch in a Nantucket Sound springtime trawl fishery directed at long-finned squid (*Loligo pealei*). Those bycatch estimates were about 3,100 fish (17,600 pounds). Anecdotal information was also reported for this fishery which suggested that striped bass bycatch ranged from 8,000 pounds per day, with up to single tows landing 19,000 pounds. Although DMF sampled this fishery during 1995 and observed incidental catches of striped bass, effort data is currently unavailable to extrapolate sample information. DMF will continue to monitor and investigate potential sources of striped bass bycatch during 1996 and will provide past estimates as they become available.

Estimated Total Losses

Total estimated loss of striped bass during 1995 was 387,900 fish weighing 3,896,100 pounds (Box 3). The majority of which, 86% by number and 76% by weight, was attributed to combined losses in the recreational fishery.

Box 3. Preliminary estimates of striped bass losses occurring in Massachusetts waters during 1995.

COMMERCIAL HARVEST RELEASE MORTALITY	<u>NUMBER</u>	<u>POUNDS</u>	<u>MEAN WT.</u>
	41,200	782,000	19.0
	11,300	144,600	12.8
RECREATIONAL HARVEST RELEASE MORTALITY	73,200	1,614,400	22.1
	262,200	1,355,100	5.2
TOTALS	387,900	3,896,100	10.4

Required Fishery Independent Monitoring Programs

Massachusetts Tagging Study

The Massachusetts Division of Marine Fisheries (DMF) joined the Striped Bass Cooperative State-Federal Coastwide Tagging Study in 1991. The study's primary objective has been to develop an integrated database of tag releases and recoveries that will provide current information related to striped bass mortality and migration rates. The vast majority of striped bass tagged prior to 1991 (the tagging study began in 1986) have ranged from 18 to 28 inches in length. Since Atlantic coastal fisheries had employed minimum sizes of 28-36 inches, resulting mortality estimates from these data may have understated the effects fishing has had on larger striped bass. The Massachusetts tagging effort has therefore focused on the tag and release of larger fish that reach coastwide legal sizes. To accomplish this job, the USFWS, NBS and DMF have contracted several select charter boat captains to take DMF personnel on board to tag and release their catch during regularly scheduled fishing trips. All fish are caught in the fall by trolling artificial baits in shoal areas around Nantucket Island.

Summary statistics to date are presented in Box 4. Tag-recapture data was analyzed using the SURVIV software of White (1983). This software implements the ESTIMATE routines of Brownie, et al. (1985) to make maximum likelihood estimates of survival rate and recovery rate parameters from tag-recapture data. Sequential models of increased generality in terms of survival and recovery rate structure were fit, and goodness of fit and likelihood ratio testing were used to select the most parsimonious model. Estimates of total mortality (Z) were calculated as $Z = -\ln(S)$; fishing mortality was calculated assuming $M = 0.20$ per year (Box 5).

Box 4. Summary tagging statistics.

YEAR	TRIPS	BOATS	NUMBER TAGGED	AVERAGE LENGTH	SE	LENGTH RANGE	
						MINIMUM	MAXIMUM
1991	17	4	388	817	5.4	534	1300
1992	29	3	899	798	4.2	524	1267
1993	15	2	678	784	4.8	515	1210
1994	13	2	375	735	4.8	548	1028
1995	11	2	477	767	5.2	470	1178

Box 5. Estimates of Survival Rates from the SURVIV Analysis of Tag-Recapture Data.

SURVIVAL PERIOD	SIZE CLASS	S (SE)	Z	F	MODEL TYPE		GOF P-val.
					SURV.	RECOV.	
12/91-11/93	ALL	0.78(0.09)	0.25	0.05	CONST	CONST	0.3
	>28	0.84(0.10)	0.17		CONST	CONST	0.5
12/91-11/94	ALL	0.83(0.05)	0.19		CONST	CONST	0.7
	>28	0.86(0.06)	0.15		CONST	CONST	0.8
	>34	0.90(0.01)	0.11		CONST	CONST	0.4

Table 1. Estimated size distribution of the 1995 Massachusetts commercial striped bass catch.
(Number of Fish)

*TL	RELSUB	SOLD	CONSUM	RELLEG	TOTAL	PERC.	CUM. PERC.
15	1,371				1,371	0.7	0.7
16	1,371				1,371	0.7	1.5
17	0				0	0.0	1.5
18	0				0	0.0	1.5
19	0				0	0.0	1.5
20	0				0	0.0	1.5
21	0				0	0.0	1.5
22	2,741				2,741	1.5	2.9
23	0				0	0.0	2.9
24	0				0	0.0	2.9
25	2,741				2,741	1.5	4.4
26	0				0	0.0	4.4
27	1,371				1,371	0.7	5.1
28	12,335		11		12,346	6.5	11.6
29	4,112		11		4,123	2.2	13.8
30	0		0		0	0.0	13.8
31	35,633		0		35,633	18.9	32.7
32	2,741		0		2,741	1.5	34.2
33	28,781	73	22		28,876	15.3	49.5
34	19,187	1,833	168	401	21,588	11.4	60.9
35	12,335	7,331	380	1,269	21,315	11.3	72.2
36	1,371	7,038	448	668	9,523	5.0	77.3
37	0	6,671	1,701	2,671	11,043	5.9	83.1
38	0	6,085	1,152	1,536	8,773	4.7	87.8
39	0	4,325	302	267	4,894	2.6	90.4
40	1,371	2,859	559	734	5,523	2.9	93.3
41	0	2,786	380	668	3,834	2.0	95.3
42	0	880	235	267	1,382	0.7	96.1
43	0	806	224	267	1,297	0.7	96.7
44	2,741	73	157	401	3,372	1.8	98.5
45	0	293	90	200	583	0.3	98.8
46	1,371	0	134	134	1,638	0.9	99.7
47		0	67	0	67	0.0	99.7
48		73	90	67	230	0.1	99.9
49		0	45	67	112	0.1	99.9
50		0	11		11	0.0	99.9
51		73	34		107	0.1	100.0
52			22		22	0.0	100.0
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Totals:	131,569	41,200	6,243	9,615	188,627		
Ave. Size:	31.8	37.5	38.9	38.3	33.6		

* Size interval 15 contains fish measuring from 14.1 to 15, and so on...

Table 2. Estimated size distribution of the 1995 Massachusetts commercial striped bass catch.
(Pounds of Fish)

*TL	RELSUB	SOLD	CONSUM	RELLEG	TOTAL	PERC.	CUM. PERC.
15	1,544				1,544	0.1	0.1
16	1,886				1,886	0.1	0.1
17	0				0	0.0	0.1
18	0				0	0.0	0.1
19	0				0	0.0	0.1
20	0				0	0.0	0.1
21	0				0	0.0	0.1
22	10,112				10,112	0.4	0.5
23	0				0	0.0	0.5
24	0				0	0.0	0.5
25	15,023				15,023	0.5	1.0
26	0				0	0.0	1.0
27	9,533				9,533	0.3	1.4
28	96,028		87		96,115	3.5	4.9
29	35,684		97		35,781	1.3	6.2
30	0		0		0	0.0	6.2
31	380,215		0		380,215	13.9	20.1
32	32,269		0		32,269	1.2	21.3
33	372,705	924	290		373,918	13.7	35.0
34	272,538	25,327	2,384	5,691	305,939	11.2	46.2
35	191,659	110,824	5,911	19,713	328,106	12.0	58.2
36	23,237	116,090	7,588	11,321	158,235	5.8	64.0
37	0	119,789	31,387	49,294	200,470	7.3	71.3
38	0	118,665	23,100	30,784	172,549	6.3	77.6
39	0	91,418	6,563	5,802	103,783	3.8	81.4
40	32,202	65,358	13,144	17,258	127,962	4.7	86.1
41	0	68,743	9,648	16,936	95,327	3.5	89.6
42	0	23,390	6,421	7,299	37,111	1.4	91.0
43	0	23,062	6,578	7,851	37,491	1.4	92.4
44	86,519	2,251	4,944	12,646	106,360	3.9	96.2
45	0	9,654	3,029	6,778	19,461	0.7	97.0
46	49,644	0	4,863	4,837	59,345	2.2	99.1
47		0	2,599	0	2,599	0.1	99.2
48		2,948	3,699	2,759	9,406	0.3	99.6
49		0	1,971	2,941	4,913	0.2	99.7
50		0	525		525	0.0	99.8
51		3,556	1,674		5,230	0.2	100.0
52			1,185		1,185	0.0	100.0
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Totals:	1,610,798	782,000	137,686	201,911	2,732,394		
Ave. Size:	12.2	19.0	22.1	21.0	14.5		

* Size interval 15 contains fish measuring from 14.1 to 15, and so on...

Table 3. Estimated size distribution of the 1995 Massachusetts recreational striped bass catch.
(Number of Fish)

*TL	RELSUB	CONSUM	RELLEG	TOTAL	PERC.	CUM. PERC.
6	471			471	0.0	0.0
7	2,828			2,828	0.1	0.1
8	6,884			6,884	0.2	0.3
9	12,256			12,256	0.4	0.7
10	91,738			91,738	2.7	3.4
11	101,583			101,583	3.0	6.4
12	367,045			367,045	11.0	17.4
13	176,644			176,644	5.3	22.7
14	267,018			267,018	8.0	30.6
15	355,145			355,145	10.6	41.2
16	200,688			200,688	6.0	47.2
17	238,902			238,902	7.1	54.4
18	270,613			270,613	8.1	62.4
19	81,960			81,960	2.4	64.9
20	131,022			131,022	3.9	68.8
21	73,550			73,550	2.2	71.0
22	81,096			81,096	2.4	73.4
23	22,892			22,892	0.7	74.1
24	44,286			44,286	1.3	75.4
25	10,056			10,056	0.3	75.7
26	52,456			52,456	1.6	77.3
27	24,674			24,674	0.7	78.0
28	29,825	131		29,957	0.9	78.9
29	32,176	131		32,308	1.0	79.9
30	11,834	0		11,834	0.4	80.2
31	29,348	0		29,348	0.9	81.1
32	13,148	0		13,148	0.4	81.5
33	20,612	262		20,874	0.6	82.1
34	2,357	1,968		4,325	0.1	82.2
35		4,460	51,412	55,872	1.7	83.9
36		5,247	51,412	56,659	1.7	85.6
37		19,940	123,388	143,328	4.3	89.9
38		13,512	71,976	85,488	2.6	92.4
39		3,542	20,565	24,107	0.7	93.1
40		6,559	61,694	68,253	2.0	95.2
41		4,460	61,694	66,154	2.0	97.2
42		2,755	20,565	23,320	0.7	97.9
43		2,624	10,282	12,906	0.4	98.2
44		1,837	20,565	22,401	0.7	98.9
45		1,049	10,282	11,332	0.3	99.2
46		1,574	20,565	22,139	0.7	99.9
47		787		787	0.0	99.9
48		1,049		1,049	0.0	100.0
49		525		525	0.0	100.0
50		131		131	0.0	100.0
51		394		394	0.0	100.0
52		262		262	0.0	100.0
Totals:	2,753,108	73,200	524,400	3,350,708		
Ave. Size:	16.6	38.9	38.8	20.6		

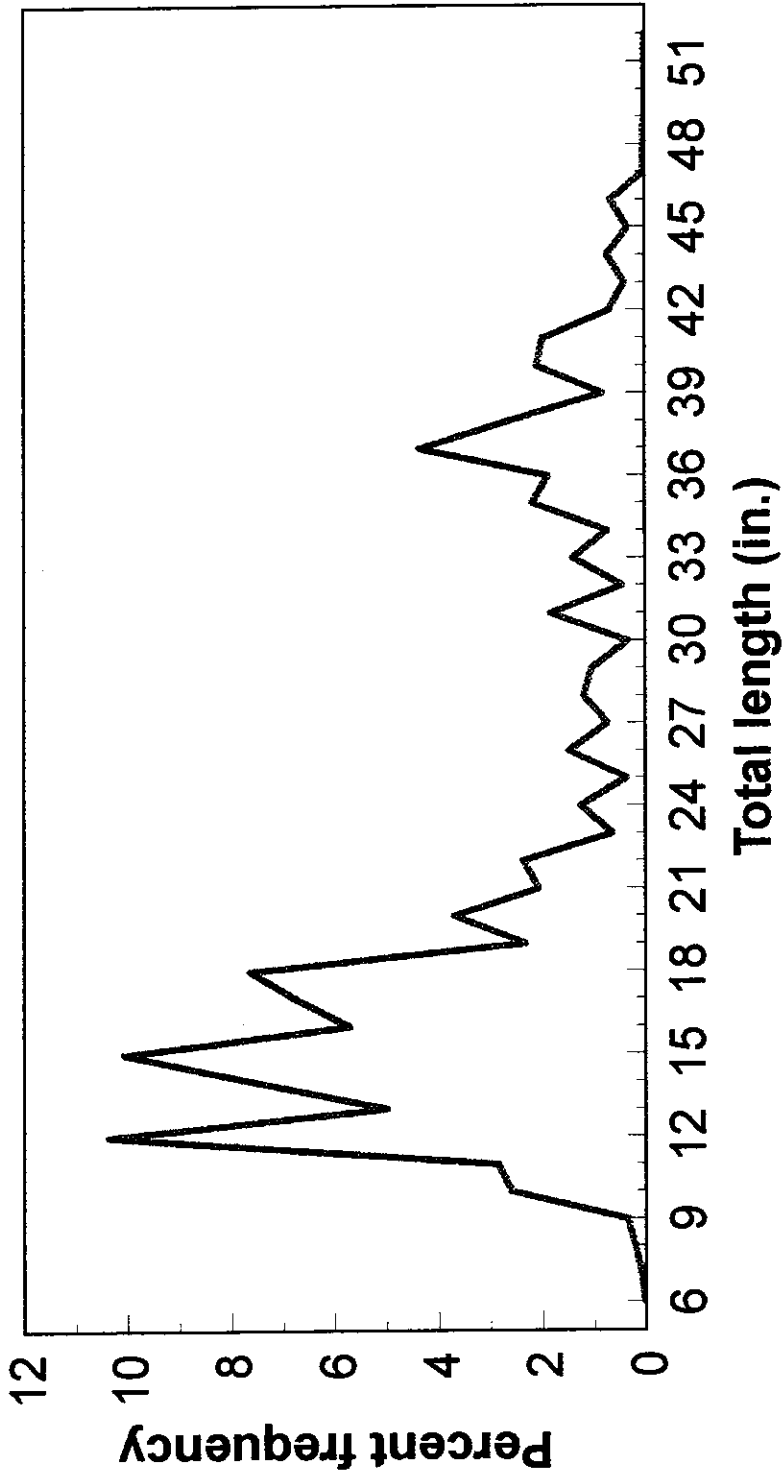
* Size interval 15 contains fish measuring from 14.1 to 15, and so on...

Table 4. Estimated size distribution of the 1995 Massachusetts recreational striped bass catch.
(Pounds of Fish)

*TL	RELSUB	CONSUM	RELLEG	TOTAL	PERC.	CUM. PERC.
6	31			31	0.0	0.0
7	301			301	0.0	0.0
8	1,107			1,107	0.0	0.0
9	2,838			2,838	0.0	0.0
10	29,442			29,442	0.2	0.2
11	43,796			43,796	0.2	0.4
12	207,191			207,191	1.1	1.5
13	127,764			127,764	0.7	2.2
14	242,954			242,954	1.3	3.5
15	400,116			400,116	2.1	5.7
16	276,126			276,126	1.5	7.1
17	396,593			396,593	2.1	9.3
18	536,233			536,233	2.9	12.1
19	192,011			192,011	1.0	13.2
20	359,799			359,799	1.9	15.1
21	234,920			234,920	1.3	16.3
22	299,162			299,162	1.6	17.9
23	96,913			96,913	0.5	18.5
24	213,900			213,900	1.1	19.6
25	55,116			55,116	0.3	19.9
26	324,633			324,633	1.7	21.6
27	171,634			171,634	0.9	22.6
28	232,200	1,021		233,221	1.2	23.8
29	279,260	1,139		280,399	1.5	25.3
30	114,080	0		114,080	0.6	25.9
31	313,150	0		313,150	1.7	27.6
32	154,790	0		154,790	0.8	28.4
33	266,919	3,398		270,316	1.4	29.9
34	33,478	27,950		61,428	0.3	30.2
35	0	69,304	798,853	868,158	4.6	34.8
36	0	88,968	871,680	960,648	5.1	40.0
37	0	368,016	2,277,301	2,645,317	14.2	54.1
38	0	270,851	1,442,800	1,713,651	9.2	63.3
39	0	76,947	446,761	523,709	2.8	66.1
40	0	154,118	1,449,604	1,603,722	8.6	74.7
41	0	113,129	1,564,809	1,677,937	9.0	83.7
42	0	75,288	562,020	637,307	3.4	87.1
43	0	77,123	302,253	379,376	2.0	89.1
44	0	57,970	649,114	707,085	3.8	92.9
45	0	35,513	347,951	383,464	2.1	95.0
46	0	57,022	744,920	801,942	4.3	99.3
47	0	30,475	0	30,475	0.2	99.4
48	0	43,371	0	43,371	0.2	99.7
49	0	23,115	0	23,115	0.1	99.8
50	0	6,152	0	6,152	0.0	99.8
51	0	19,623	0	19,623	0.1	99.9
52	0	13,893	0	13,893	0.1	100.0
Totals:	5,606,457	1,614,386	11,458,065	18,678,909		
Ave. Size:	2.0	22.1	21.8	5.6		

* Size interval 15 contains fish measuring from 14.1 to 15, and so on...

**Estimated length frequency distribution of striped bass
in Massachusetts commercial and recreational
fisheries during 1995.**



4/26 Sandwich Is
5/22 Gloucester MS
6/2 MFC vote

**Relative index of striped bass abundance based on cpue
information collected from the Massachusetts
commercial fishery.**

